

[illegible]

SUPPORTING INFORMATION

CATEGORY	NO.
EQUIPMENT OWS	J9301687-() EO-994374-()
EQUIPMENT DESIGN REGT	J93016
MAINTENANCE BSP	204-923-301
KEYSHEET DRAWING	32-14105-01 32-14134-01 32-31652-01

[illegible]

SHEET INDEX NOTES

1. WHEN CHANGES ARE MADE IN THIS DRAWING, ONLY THOSE SHEETS AFFECTED WILL BE REISSUED.
2. THIS SHEET INDEX WILL BE REISSUED AND BROUGHT UP TO DATE EACH TIME ANY SHEET OF THE DRAWING IS REISSUED, OR A NEW SHEET IS ADDED.
3. THE ISSUE NUMBER ASSIGNED TO A CHANGED OR NEW SHEET WILL BE THE SAME ISSUE NUMBER AS THAT OF THE SHEET INDEX.
4. SHEETS THAT ARE NOT CHANGED WILL RETAIN THEIR EXISTING ISSUE NUMBER.
5. THE LAST ISSUE NUMBER OF THE SHEET INDEX IS RECOGNIZED AS THE LATEST ISSUE NUMBER OF THE DRAWING AS A WHOLE.

NOTICE-NOT FOR USE OR DISCLOSURE OUTSIDE THE BELL
SYSTEM EXCEPT UNDER WRITTEN AGREEMENT.

ISSUE
15A9

SD-99308-01	11899	AT&T STANDARD
COMMON SYSTEMS		
FAR END TEST TRUNK OR LINE CIRCUIT		
FOR REMOTE TESTING FROM LOCAL TEST ROOM	(2)	
(TST TRK OR L)		SD-99308-Of At 17 SHEETS
BELL TELEPHONE LABORATORIES	65	PRINTED ON U.S. G.

APPARATUS INDEX

DESIG	LOCATION	
	FS	APP FIG. EOP
RELAYS		
ANS	156	1
CH	151	1
CT	192	1
NC	106	1
NCI	102	1
ND	206	1
RST	106	1
RSTI	104	1
RT6	102	1
RTT	152	1
SD	134	1
TK1	196	1
TK1	487	1
TR2	487	1

CAPACITORS

C1	102, 1F1	1
C2	103, 1E3	1
C3	105	1
C4	105	1
C5	105	1
C6	105	1
C7	105	1
C8	1H5	1
C9	1E2, 1F2	1
C10	101, 1E1	1

CIRCUIT PACK

DDT	1H2	1
OTO	1A8	1
TKR	1H5	1

CONNECTORS

J1	2B1, 2B5	1
J2	200	1

DIAL

DIAL	2A3	1
------	-----	---

DESIG	LOCATION	
	FS	APP FIG. EOP
LAMP		
RT	1B0	1 CA1

RESISTORS

R1	1B0	1
R2	100	1
R3	1H4	1
R4	132	1
R5	1H7	1
R6	1H3	1
RT	1B0	1 CA1

TRANSFORMER

TRNSF	2F1	1
-------	-----	---

TUBE, ELECTRON

RTR	1C2	1
RTT	1A1	1

UNIT, POWER

AC	2B1	1
----	-----	---

LEAD INDEX

DESIG	LOCATION	
	FS	CAD
CONNECTOR MULTIPLE (CSX)		
R	1A0	2B1
S	1A0	2B1
T	1A0	2B1

LINE SELECTOR CKT (EO PANEL)

R	1A0	2B1
S	1A0	2B1
T	1A0	2B1

FINAL SELECTOR CKT (EO PANEL)

R	1A0	2B1
S	1A0	2B1
T	1A0	2B1

REMOTE TESTING CKT FAR-END

ANS	1F7	1B0
D15	107	1B0
E OR E1N1	1E7	1A0
NC	1G7	1B0
ON	1F7	1B0
ON1	1H7	1B0
R OR R1	1G7	1B0
RS	1E7	1B0
T OR T1	1G7	1B0

INTERRUPTER CKT (CSB1, S & PANEL)

LBT	1F0	100
ST	1F0	100
ST3	1F0	100

LINE, LINE LINE, AND MARKER COM. CKT (CSX)

R	1A0	2B0
T	1B0	2B0

LINE SWITCHING CKT (10, 1 CSX)

R	1A0	2A1
T	1A0	2A1

LINE AND/OR TRUNK SWITCHING CKT (10, 2 CSX)

R	1A0	2A1
T	1A0	2A1

RINGING AND TONE CIRCUIT (NO. 2 CSX)

R1BT 60)	1E0	1F0
T1BT 60)	1E0	1F0

DESIG	LOCATION	
	FS	CAD
SUBSCRIBER LINE (CSB1, S, PANEL SXS)		
R	1G0	2B1
T	1G0	2B1

SUBSCRIBER LINE, LINE LINE AND CONTROLLER CKT (CSB1)

R	1A0	2B1
T	1A0	2B1

TEST TRUNK FOR INCOMING REMOTE TESTING

A	1A2	1C0
B	1A2	1C0
C	1A3	1C0

RS1	107	1C0
-----	-----	-----

TRUNK DISTRIBUTING CKT (NO. 1 CSX)

R (LT80)	1E0	1F0
TILT80	1E0	1F0

TONE SUPPLY CKT (SXS)

LT1-50 IPW-BT	1E0	1E0
LT4-50 IPW-BR4	1E0	1E0
LT3-50 IPW-BR2	1E0	1E0
972-50 IPW	1E0	1E0

OPTION INDEX

APP	DE	LOC
Z	101	
Y	101	
X	100	
W	103, 102, 101	
V	103, 102, 101	
T	APP FIG. 1, 2F1	
S	APP FIG. 1, 2F1	
R	104, 1E1	
Q	104, 1E1	
P	APP FIG. 1, 1C1, 1H2	
N	1A2, 1A3, 107	
M	APP FIG. 1, 107	
K	1E2, 1E3, 102, 1H6	
J	APP FIG. 1, 1E3, 1F2	
H	APP FIG. 1	
G	1E1, 1E2, 1F2	
F	APP FIG. 1, 1E2	
E	APP FIG. 1, 1E2	
D	APP FIG. 1, 1D1, 1E1, 1F2	
B	APP FIG. 1, 1D1, 1E1, 1F2	
ZA	APP FIG. 1, 1C0, 1C3	
ZB	APP FIG. 1	
ZC	APP FIG. 1, 1E3, 1F6, 1G3, 1G4, 1G5	
ZE	APP FIG. 1, 1E6, 1F5, 1F6, 1G4, 1G5	
ZE	1H5	

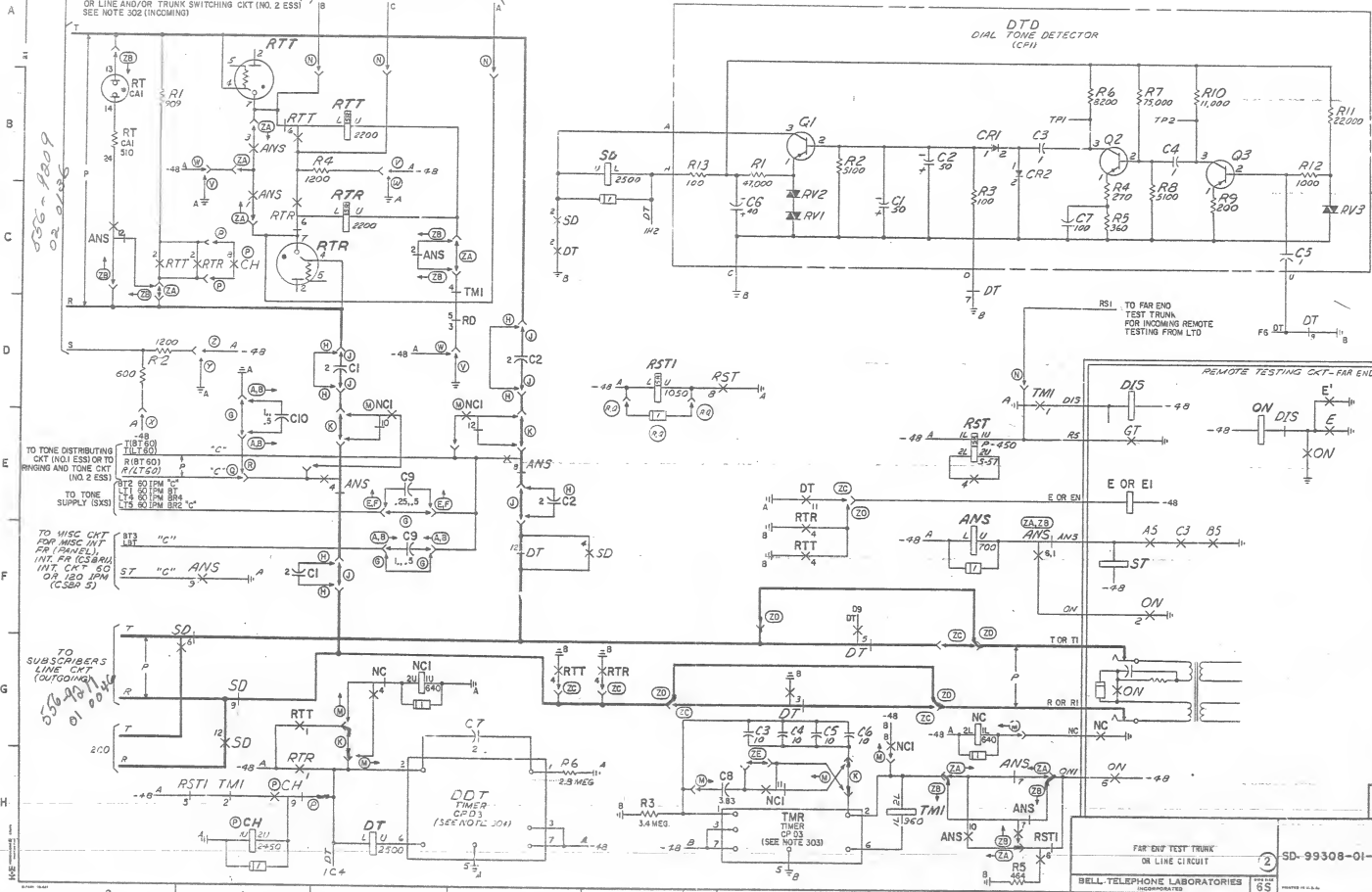
TO LINE, LINE LINK AND MARKER COMM CONTROL CKT
AND 5 CSBRI OR SUB LINE LINK AND CONTROLLER
CKT (NO. 1 CSBRI OR FINAL SELECTOR CKT (800 PANEL)
OR FINAL SELECTOR CKT (800 PANEL) OR CONNECTOR
MULTIPLE (2X3) OR LINE SWITCHING CKT (NO. 1 ESS),
OR LINE AND/OR TRUNK SWITCHING CKT (NO. 2 ESS)
SEE NOTE 102 (INCOMING)

TO FAR END TEST TRUNK FOR
INCOMING REMOTE TESTING FROM LTD

FSI

AUTOMATIC ANSWER AND DIAL TONE DETECTOR

DTD
DIAL TONE DETECTOR
(CPU)



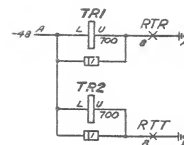
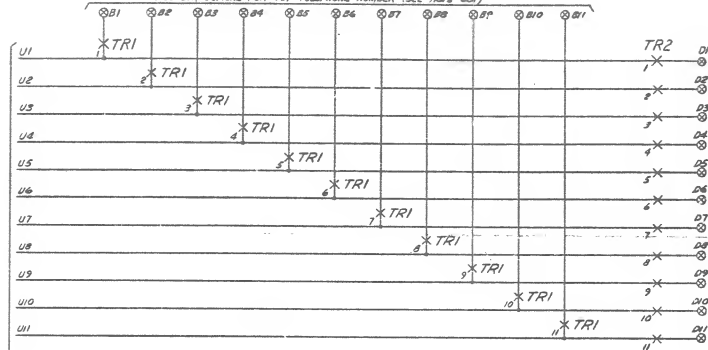
A vertical scale with labels A, B, C, D, E, F, G, and H. A horizontal line is drawn between labels C and D.



-

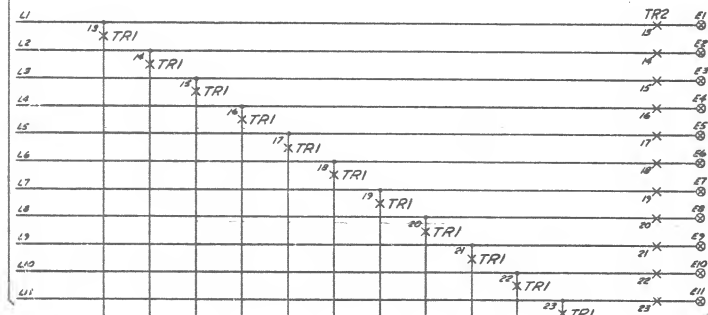
FS 3 JULING TRANSFER AND TELEPHONE NUMBER CROSSCONNECT

CROSS CONNECTIONS FOR 1ST TELEPHONE NUMBER (SEE NOTE 401)

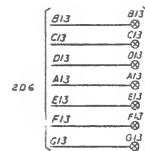


2C6, 2F6

CROSS CONNECTIONS FOR
2ND TELEPHONE NUMBER
(SEE NOTE 401)



CROSS CONNECTIONS FOR 1ST TELEPHONE NUMBER (SEE NOTE 401)



CROSS CONNECTIONS FOR
1ST AND 2ND TELEPHONE
NUMBERS
(SEE NOTE 401)

FAR END TEST THRU
ON LINE CIRCUIT

BELL TELEPHONE LABORATORIES

SD-99308-01-84

2

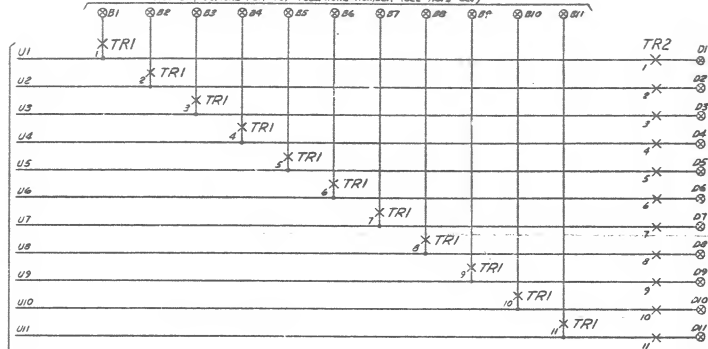
85

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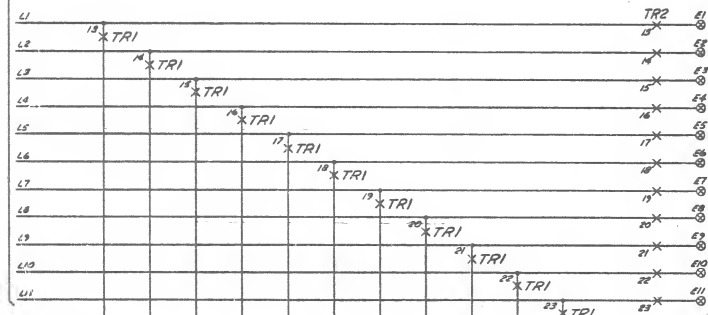
SD-99308-01-84

FS 3 DIALING TRANSFER AND TELEPHONE NUMBER CROSSCONNECT

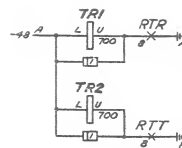
CROSS CONNECTIONS FOR 1ST TELEPHONE NUMBER (SEE NOTE 401)



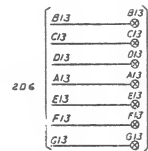
2C6, 2F6



CROSS CONNECTIONS FOR 1ST TELEPHONE NUMBER (SEE NOTE 401)



CROSS CONNECTIONS FOR
2ND TELEPHONE NUMBER
(SEE NOTE 401)



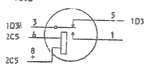
CROSS CONNECTIONS FOR
1ST AND 2ND TELEPHONE
NUMBERS
(SEE NOTE 401)

FAR END TEST TRUNK
OR LINE CIRCUIT

BELL TELEPHONE LABORATORIES

SD-99308-01-B4

APP FIG. 1

[illegible][illegible]

RELAY			
DESIG	TR1	TR2	
23	405	405	
22	405	405	
21	404	406	
20	404	406	
19	4F4	4F6	
18	4F4	4F6	
17	4E1	4E6	
16	4F5	4F6	
15	4E2	4E6	
14	4E2	4E6	
13	4E2	4E6	
12			
11	405	406	
10	405	405	
9	405	406	
8	4C0	406	
7	4C6	4C6	
6	4C3	4C6	
5	4C3	4C6	
4	4B3	4C6	
3	4B2	4B5	
2	4B3	4B5	
1	4B2	4B5	
COIL	4B7	4B7	

CAPACITOR

DESIG	LOC	CODE
(H) C1	IF1	439A
(A) C1	ID2	439A
(H) C2	IE3	439A
(A) C2	ID3	439A
C3	IO5	574B.
C4	IO5	574B
C5	IO5	574B
C6	IO5	574B
C7	IO3	579A
(M) C8	IHS	535JM
C9	IF2	(A) 1/2 439
	IE2, IF2	(B, F) 1/2 441
	IE2	(E) 441D
CIO	ID1	(A) 1/2 439
	IE1	(B) 1/2 441

CIRCUIT PACK

DESIG	LOC	CODE
DOT	IH2	CP-03
DTD	IA6	ED-99434 (CPS1)
TMR	IH5	CP-03

TRANSFORMER

<u>DESIG</u>	<u>LOC</u>	<u>CODE</u>
TRANSF	2F1	KS-16886,12

CGNNECTOR

<u>DESIG</u>	<u>LOC</u>	<u>CODE</u>
J1	281,285	KS-19162,L2
J2	260	KS-3586,L5

DIAL

<u>DESIG</u>	<u>LOC</u>	<u>CODE</u>
DIAL	243	42A

NETWOR

DESIG	LOC	CODE
(Z,A,Z) ANS	1F6	
(P) CH	1H1	
(M) NC	1G6	
(M) NCI	1G2	
(Q,R) RSTI	1D4	185A
SD	1C4	

TRITR2 4C7

TUBE, ELECTRON

<u>DESIG</u>	<u>LDC</u>	<u>CODE</u>
RTR	1C2	353A
RTT	1A1	353A

UNIT, POWER

<u>DESIG</u>	<u>LOC</u>	<u>CODE</u>
AC	201	15A

(ZB) COMPONENT ASSEMBLY	DESIG
278A TS E/W	CAI

The diagram shows a Wheatstone bridge circuit. The bridge has four nodes labeled 26, 25, 24, and 23 on the left, and 16, 15, 14, and 13 on the right. A variable resistor, labeled RT , is connected between nodes 25 and 15. A battery, labeled RT , is connected between nodes 24 and 14. The bridge is completed by a wire between nodes 26 and 16, and another wire between nodes 23 and 13.

LAMP

<u>DESIG</u>	<u>LOC</u>	<u>CODE</u>
RT	180	GE5AHB

RESISTORS

<u>DESIG</u>	<u>LDC</u>	<u>CODE</u>
RT	1B0	KS-13492, LI, 510

CIRCUIT NOTES:

101.

DESIG	FUSE RTP	POTENTIAL	ONE PER
A*	1-1/2	-48 VIB	APP FIG. 1
B*	1-1/2	-48 VIB	APP FIG. 1
A		GRD	APP FIG. 1
B		GRD	APP FIG. 1
LT	1-1/2	L14, S OR 6	CAT IN SXS NO. 1 ON 350A OFFICE
*BATTERY LEADS SHALL BE PAIRED TO THE FUSE PANEL WITH SIMILARLY DESIGNATED GROUND LEADS			
BATTERY SYMBOL		VOLTAGE RANGE	
-48		42.75 TO 52.5	

102.

FEATURE OR OPTION		PROVIDE	
		APP OR HSD	QUANTITY
TEST TRUNK OR LINE CKT WITH CENTRAL NON- DEDICATED FACILITIES	CROSSBAR	A,B,H	ONE PER CKT
	COR PREHE TONE	A,B,H	
	SXS	A,B,H	
	SXS PREHE TONE	A,B,H	
	PANEL GCD	A,B,H	
	PANEL GCD	A,B,H	
CENTRAL OFFICE RINGING SUPPLY	ES	A,B,H	ONE PER CKT
	ES	A,B,H	
	ES	A,B,H	
DIAL MOTOR TO BE POWERED BY USE NOTES 105, 106 & 107	GROUND MACHINE RINGING	W	ONE PER CKT
	RINGING WITH -48 OC COMPONENT	V	
NIGHT TEST COVERAGE	COMMERCIAL 120V AC	S	ONE PER CKT
	CENTRAL OFFICE BATTERY	T	
CALL COMPLETION OF ASSISTANCE CALLS FROM CRAFTSMAN TO LTD VIA DDD FACILITIES	REQUIRED	M,Z,E	SEE NOTE 102 & TEST NOTE 10 SH, FI
	NOT REQUIRED		
OUTGOING SUB- SCRIBER LINE CKT REQUIRES	ROUND GROUND START	N	ONE PER CKT
	CONTINUOUS LOOP START	ZC	

103.

NETWORK VALUES		
NETWORK NO.	RESISTANCES IN OHMS	CAPACITANCE IN UF
1	470	0.11

104.

RECORD OF FIGURES, WIRING AND APPARATUS CHANGES									
CHANGED ON ISS	IF THIS RECORDS DO NOT SPECIFY	THIS OPTION FURN	SEE NOTE	USE IN CIRCUIT					
3B			102, 107	STO	AN	NO			
10B	P	NONE							
	N	NONE	102, 402	N					
	K OR M	K							
120	J OR H	J	102	J,H					
	A,B,E,F OR G	G	102	A,B, E, F		0			
	ZA OR ZB	ZA		ZB		ZA			
13B	ZC OR ZD	ZC	102	ZC, ZD					
140	ZE	NONE		ZE					

CIRCUIT NOTES: (CONT)

105. TO PERMIT TESTING DURING PERIODS OF POWER FAILURES AND WHERE RAPID TRANSFER TO EMERGENCY AC POWER IS NOT AVAILABLE, CONSIDERATION SHOULD BE GIVEN TO USING CENTRAL OFFICE -48V BATTERY WITH T OPTION (E16A POWER UNIT).
106. (TRANSF) TRANSFORMER REQUIRES 5 WATTS. IT IS SELF PROTECTED AND CONSIDERATION SHOULD BE GIVEN TO CONNECTING TO POWER DISTRIBUTION FACILITIES THAT ARE PROTECTED BY EMERGENCY AC POWER.
107. IN ESS OFFICES, T OPTION SHALL BE PROVIDED FOR POWERING THE DIAL MOTOR.

INFORMATION NOTES:

301. UNLESS OTHERWISE SPECIFIED:
RESISTANCE VALUES ARE IN OHMS.
CAPACITANCE VALUES ARE IN MICROFARADS.
VALUES PRECEDED BY THE SYMBOL + (PLUS) OR - (MINUS) ARE IN VOLTS.
302. THIS EQUIPMENT SHALL BE ASSIGNED A SUBSCRIBER LINE APPEARANCE ARRANGED FOR INWARD SERVICE ONLY.
303. THE TIMING CYCLE OF (TMR) TIMER MAY BE CHECKED USING A WATCH, BY MANUALLY OPERATING (ON) RELAY IN 50-99311-01 AND OBSERVING THAT (TRV) RELAY OPERATES WITHIN 85-115 SECONDS.
304. THE TIMING CYCLE OF THE (OOT) TIMER MAY BE CHECKED USING A WATCH, BY MANUALLY OPERATING (RTT) RELAY AND OBSERVING THAT (OT) RELAY OPERATES IN APPROXIMATELY 6 SECONDS.
305. WHEN NIGHT TEST COVERAGE FEATURE (OPTIONS M,Z,E) IS PROVIDED, THE ALTERNATE TIMING CYCLE OF (TMR) TIMER MAY BE CHECKED USING A WATCH/CLOCK RELAY (NC) OPERATED AND OBSERVE THAT (TM) RELAY OPERATES IN APPROXIMATELY 11.5 SECONDS.

ISSUE
15AR

FOR END TEST TRUNK
OF LINE CIRCUIT

2

SD-99308-01-01

BELL TELEPHONE LABORATORIES

15AR

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ANT



INSTRUCTIONS FOR WIRING

- I. TO CONNECT 1ST TELEPHONE NUMBER.
 - A. WIRE 1ST TELEPHONE NUMBER IN COLUMNS MARKED "1ST TELEPHONE NUMBER DIGITS" OF BOTH UPPER AND LOWER CIPHER BLOCKS, PUTTING IN THE 10TH DIGIT OF THE TELEPHONE NUMBER NEXT TO TERMINAL 31 OF THE UPPER CIPHER BLOCK AND THE 10TH DIGIT NEXT TO TERMINAL 39 OF LOWER CIPHER BLOCK. (10TH DIGIT TELEPHONE NUMBER ON LEFT SIDE OF TERMINAL 32 ON 10-DIGIT TELEPHONE NUMBER.)
 - B. WIRE THE 1ST TELEPHONE NUMBER DIGITS OF THE UPPER CIPHER BLOCK TO IDENTICAL DIGITS OF THE UPPER BRUSH AND WIRE THESE TERMINALS ASSOCIATED TERMINALS TOGETHER.
 - C. MATCH THE 1ST TELEPHONE NUMBER DIGITS OF THE LOWER CIPHER BLOCK TO IDENTICAL DIGITS OF THE LOWER BRUSH AND WIRE THESE TERMINALS ASSOCIATED TERMINALS TOGETHER.
 - D. WIRE ALL UPPER TERMINALS OF THE UPPER SCRAM BLOCK TOGETHER, WIRE ALL UPPER TERMINALS OF THE LOWER SCRAM BLOCK TOGETHER, WIRE THESE TWO GROUPS TOGETHER.
- II. TO CONNECT TWO TELEPHONE NUMBERS.
 - A. REPEAT STEPS 1-4 OF PREVIOUS SECTION, USING TERMINALS OF GROUPS 31 AND E1 THROUGH E11.

ASSUME THE TELEPHONE NUMBER 949-2261.

- NOTE THAT THESE WIRES CAN BE MULTIPLIED TOGETHER.

PARTY I

UPPER SCAN BLOCK

TERM	TSP TELEPHONE NUMBER DIGIT
C1	
C2	
C3	
C4	
C5	(9)
C6	(4)
C7	(9)
C8	(2)
C9	(2)
C10	(6)
C11	(1)

UPPER BRUSH BLOCK

DIGIT	TERM
1	E13
2	E13
3	E13
4	E13
5	F13
6	G13
7	E13
8	F13
9	F13
0	F13

WATCH STEP C

LOWER SCAN BLOCK

LOWER BRUSH

EXAMPLE (CONT)

- C. MATCH 1ST TELEPHONE NUMBER DIGITS LOWER SCAN BLOCK TO LOWER BRUSH BLOCK F.

WIRE:

C5 TO G13
C6 TO E13
C7 TO G13
C8 TO F13
C9 TO F13
C10 TO G13

D. WIRE UNUSED TERMINALS TOGETHER.

WIRE •

B1 TO B2 TO
B3 TO B4 TO
C1 TO C2 TO
C3 TO C4

PHONE

2ND TELEPHONE NUMBER DIGIT	TERM
	E1
	E2
	E3
	E4
	E5
	E6
	E7
	E8
	E9
	E10
	E11

THE REGULAR TEST CENTER SHALL DIAL THE RING-SIDE TELEPHONE NUMBER FOR ACTIVATION OF THIS CIRCUIT AND THE FIRST TELEPHONE NUMBER PROGRAMED FOR THE AUTOMATIC ALIAR SHALL BE THAT OF THE REGULAR TEST CENTER. THE NIGHT COVERING OFFICE SHALL BE ASSOCIATED WITH THE INCOMING TIP SIDE TELEPHONE NUMBER AND THE SECOND TELEPHONE NUMBER OF THE AUTOMATIC ALIAR.

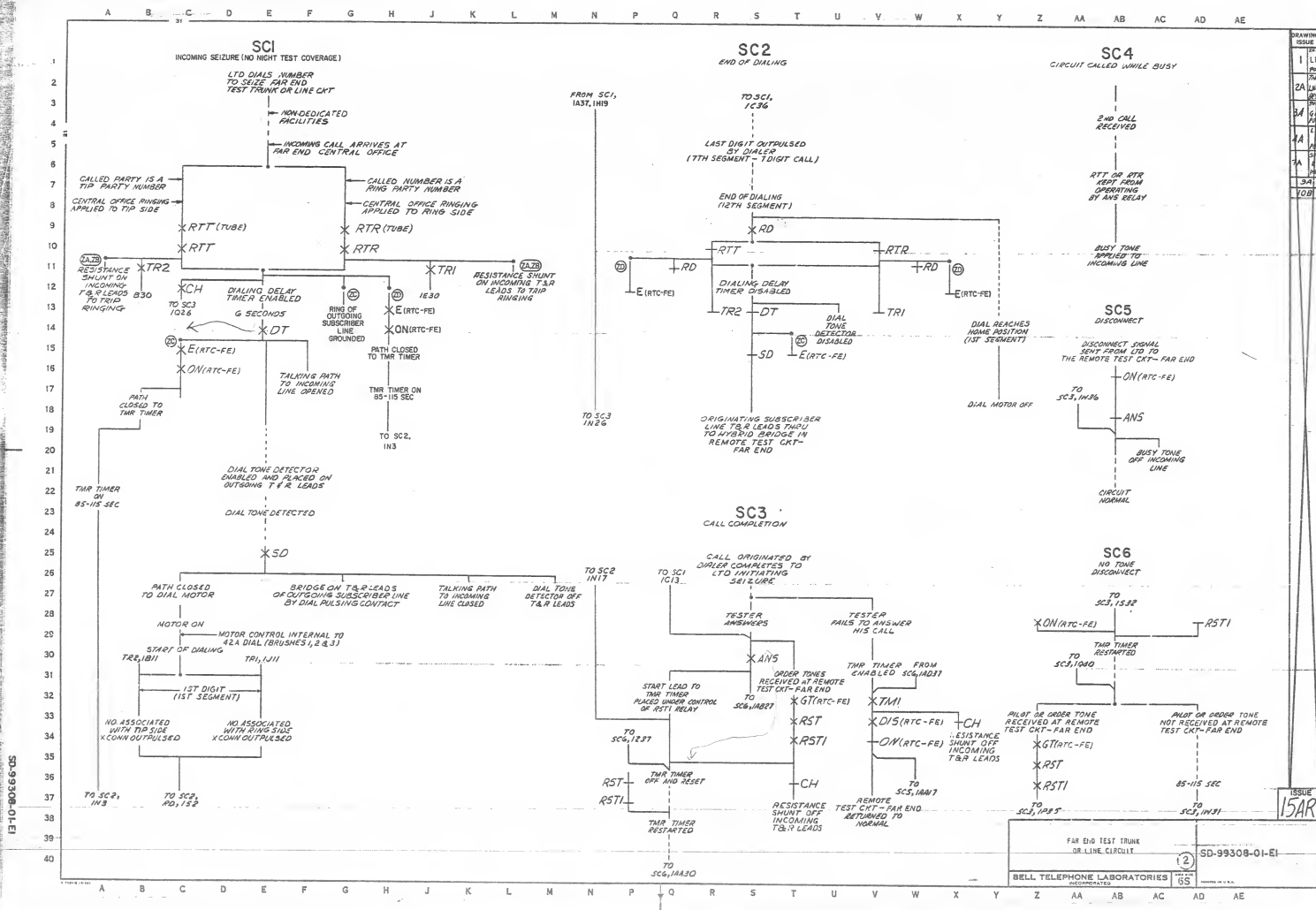
FAR END TEST TRU
OR LINE CIRCUIT

SD-99308-01-D2

BELL TELEPHONE LABORATORIES
INCORPORATED

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ME



INCOMING SEIZURE WITH NIGHT TEST COVERAGE (OPTIONS M,Z,E)

LTD DIALS NUMBER
TO SEIZE FAR END
TEST TRUNK OR LINE CKT

—NON-DEDICATED FACILITIES

—INCOMING CALL ARRIVES AT
FAR END CENTRAL OFFICE

NC

* NC

CALLER NUMBER IS A
TIP PARTY NUMBER

CENTRAL OFFICE RINGING
APPLIED TO TIP SIDE

SAME AS SCI

—CALLED NUMBER IS A
RING PARTY NUMBER

CALLER NUMBER IS A
TIP PARTY NUMBER

SAME AS SC1

SAME AS SC

—CALLED NUMBER IS A
RING PARTY NUMBER

 $\times RTT(TUBE)$ $\times RTT$

20

 $\times E(\text{RTC-FE})$

RESISTANCE SHUNT
ON INCOMING TER
LEADS TO TRIP
RINGING

~~X~~ON (RTC-FE)

✕ TR2

BUSY TONE
APPLIED TO
INCOMING LINE

* NCI

PATH CLOSED
TO TMR TIMER

1

TMR TIMER
ON 11-13 SEC

* TMI

*DIS

*DIS(RTC-FE)

ON(RTC-FE)

REMOTE TEST CKT -FAR END
RETURNED TO NORMAL

 $\perp_{TR2}$ $\perp_{TMI}$

LNCI

BUSY TONE
OFF INCOMING
LINE

REMOTE TEST CKT -FAR END
RETURNED TO NORMAL

FAR END TEST TRUNK
OR LINE CIRCUIT

②

SD-99308-01-E2

BELL TELEPHONE LABORATORIES

474	475
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10

ISSUE
15AR

SD-99308-01

CIRCUIT REQUIREMENTS

FAR END TEST TRUNK OR LINE CIRCUIT (TEST TXR OR L)

APPARATUS				MECH. REQT				CIRCUIT PREPARATION				DIRECT CURRENT FLOW REQT				REMARKS	
QUGS	CODE	QTY.	FIG.	BSP FIG.	CONT. PRES.	ARM. REVL.	BLOCK OR INSULATE	TEST CLIP DATA CONN. BAT.	TEST CLIP DATA CONN. GND.	TEST SET PREP	SEE TEST NOTE	TEST WDG FOR	TEST FOR	AFTER SOAK MA	TEST (READ) MA		
RELAYS																	
ANS	27111	ZA	1	270			6(ANS)		U(ANS)	GRD			O		45	40.5	
ANS	1A1616	ZE	1	299			6(ANS)		U(ANS)	GRD			O		41	39.0	
CD	1/2153	P	1	295			6(CH), 11(CH)	2U(CH)		BAT			U		9.2	8.7	NTD WITH (TH1)
DT	AF44	L	1	219			11(DT), 2(DT)	L(DT)	U(DT)	B/G	1.7		O		11.8	10.6	
NC	1/2AK22	M	1	218					L(NC)	GRD	8		O		27.5	26.0	MOUNTED WITH (NC1)
NC1	1/2AK22	M	1	218					2U(NC1)	GRD	BAT		O		27.5	26.0	MOUNTED WITH (NC1)
RD	3036	I	1						6(RD)	BAT	12.3		O	6	2.1	2	
RT	4022	I	1	568									R		95	1	
									1U(RT)	GRD	5	7	O	FS	36	34	
													H		5.8	5.3	
													H		3.5	4.2	
													S	R	45	42.5	
RTT	8011	I	1	235					U(RT1)	GRD			O	FS	17.5	16.5	
													H		2.3	2.1	
													R		4	7	
RT2	806	I	1	238					L(RT2)	GRD			O	18	9.3	8.8	U OPTION
													H		1.6	1.5	
									L(RT2)	BAT			O	18	9.3	8.8	Y OPTION
													H		1.6	1.5	
													H		8	1.0	
RTT	806	I	1	238					L(RTT)	GRD			O	18	9.3	8.8	U OPTION
									(RTT)				H		1.6	1.5	
									L(RTT)	BAT			O		8	1.0	
									5(RTT)	L(RTT)	521		O	18	9.3	8.8	Y OPTION
									(RTT)				H		1.6	1.5	
													H		8	1.0	
SD	8F9	I	1	213					9(SD)	GRD	3	0	O		9.1	8.2	
TH1	1/2048	I	1	204					1(TH1)	2L(TH1)	B/G	4	O		18	16	NTD WITH (CH)
TR1	81202	I	1	500						U(TR1)	GRD		O		42	40.5	
TR2	81202	I	1	500						U(TR2)	GRD		O		42	40.5	
ELECTRON TUBES																	
RTA	355A	I	1								5					SEE BSP	
RTT	355A	I	1								5					SEE BSP	
TIMING REQT																	
DDT		I	1									11					
TMR																	
		I	1								9.10						

TEST NOTES:

- REMOVE CPS-1 BEFORE MAKING TEST.
- APPLY SOAK DURING OPERATE REQUIREMENT.
- USE LAMP AT 5/5 (RDS) RELAY TO INDICATE CONTACT CLOSURE.
- REMOVE (TMR) TIMER (CP-03) BEFORE MAKING TEST.
- USE COLD CATHODE TEST SET. CONN. RT TO PIN 5 AND SW TO PIN 7 OF TUBE TO BE TESTED.
- APPLY -48V BATTERY TO 2L (TH1) AND OBSERVE THAT RELAY (TMR) OPERATES IN 85-115 SECONDS, USING A STOP-WATCH, SWEEP-SECOND WATCH OR EQUIVALENT.
- BLOCK RELAY (NC1) IF PROVIDED AND OBSERVE THAT RELAY (TH1) OPERATES IN 11-19 SECONDS.
- APPLY -48V BATTERY TO L (DT) AND OBSERVE THAT RELAY (DT) OPERATES IN 5-7 SECONDS.

TYPE	355A	50 TONING DROP (200K)
HIGH VOLTS	42	75
MAX. VOLTS	80	74

- ADJUSTURE BACK TENSION MAXIMUM ON GRAMS READJUST, 85 GRAMS TEST.

- REMOVE (DDT) TIMER (CP-03) BEFORE MAKING TEST.
- RELAY (NC1) IN SD-99301-01 NON-OPERATED.

FAR END TEST TRUNK
OR LINE CIRCUIT

SD-99308-01-F1

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SD-99308-01-F1

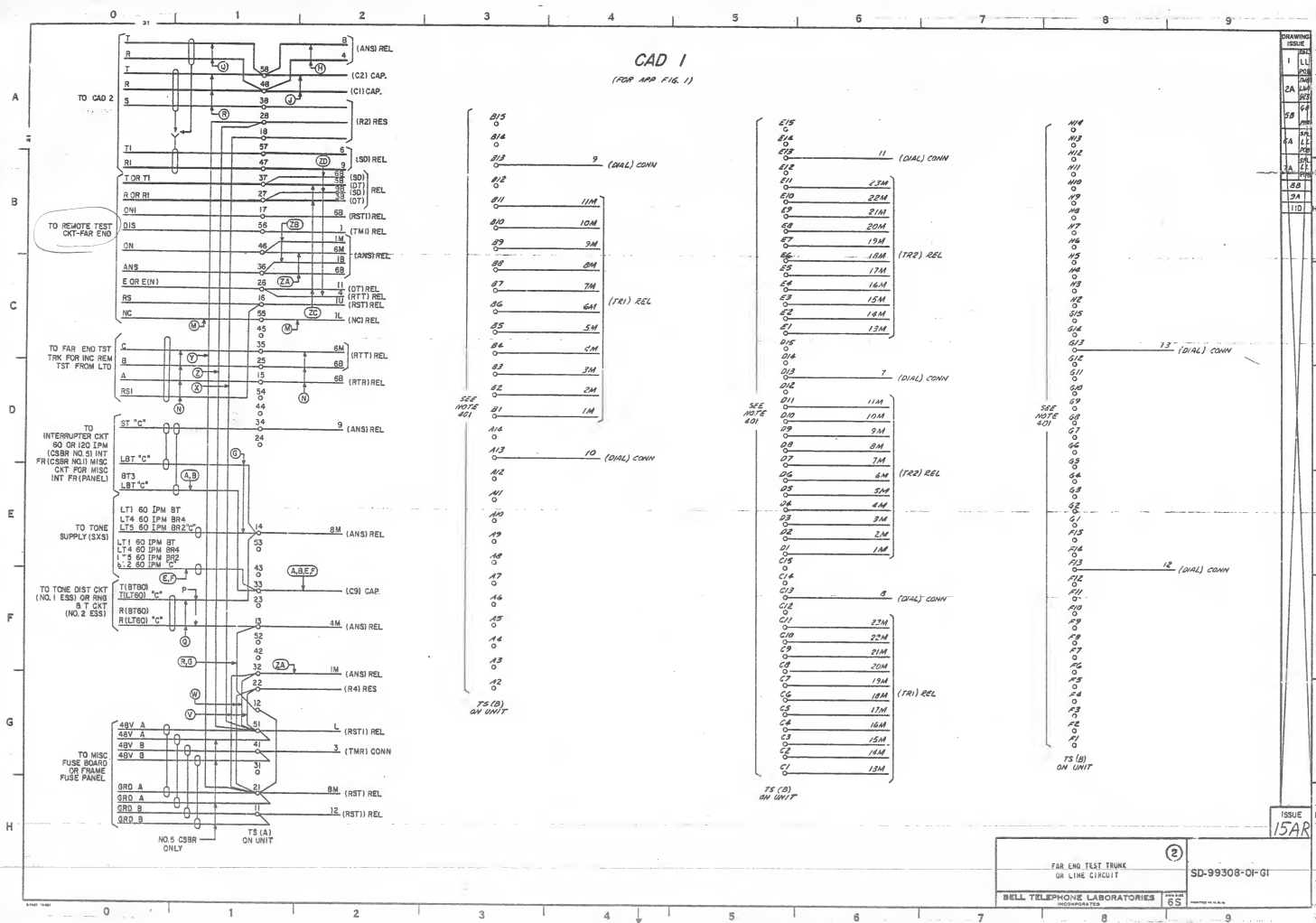
ISSUE
15ARFAR-END-TEST TRUNK
OR LINE CIRCUIT

2

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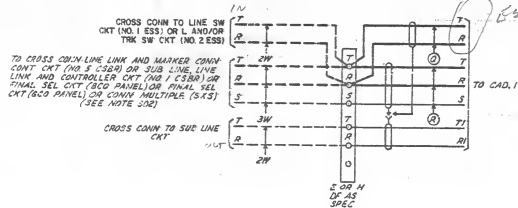
0 1 2 3 4 5 6 7 8 9

A

CAD. 2

(FOR APP FIG. 1)

B



C

D

E

F

G

H

DR	DATE	BY	CHKD
1	11	11	11
5B	11	11	11
8D	11	11	11
11D	11	11	11

E

C

D

E

F

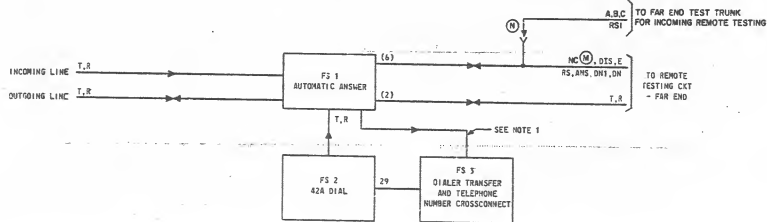
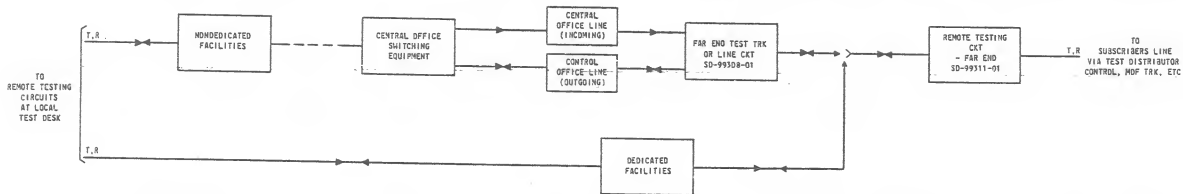
G

H

SD-99308-01-02

FAR END TEST TRUNK OR LINE CIRCUIT		2	SD-99308-01-02
BELL TELEPHONE LABORATORIES		2	
INCORPORATED			

BD 1
FS BLOCK DIAGRAM

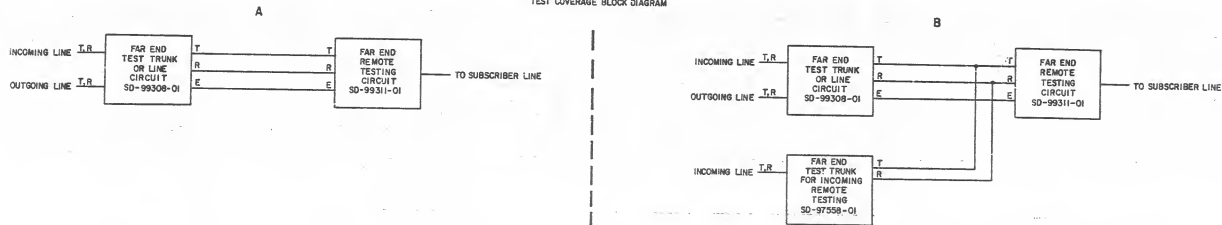
BD 2
SYSTEM BLOCK DIAGRAM

SHEET NOTES:

1. NO DIRECT LEAD, BUT CONTROLLED VIA RELAYS.

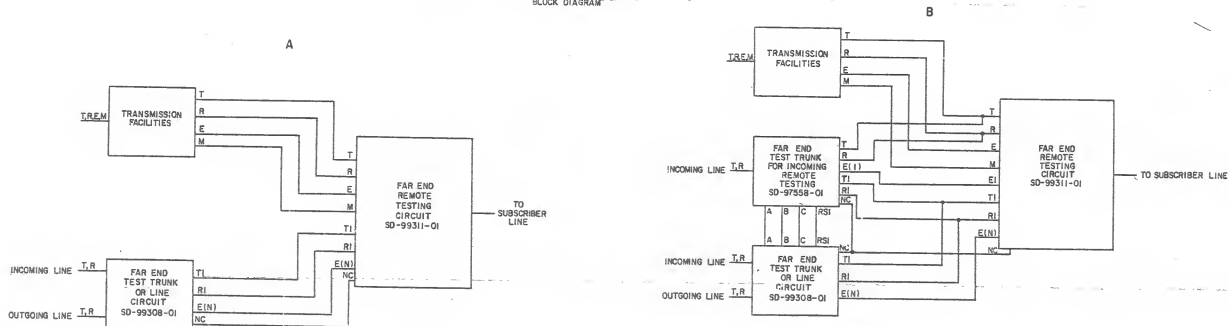
BD 3

REGULAR SERVICE AND NIGHT
TEST COVERAGE BLOCK DIAGRAM



BD 4

NIGHT TEST COVERAGE
BLOCK DIAGRAM



FAR END TEST TRUNK OR LINE CIRCUIT		SD-99308-OI-H2
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15AR

COMPONENT LIST

CAPACITOR

DESIG	CODE
C1	KS-14504
C2	
C3	KS-14358
C4	
C5	
C6	KS-16390, L3
C7	6023

DIODE

DESIG	CODE
CR1	458A
CR2	458A

RESISTOR

DESIG	CODE
R1	KS-13490L1, 47,000
R2	5100
R3	100
R4	270
R5	360
R6	5100
R7	75,000
R8	5100
R9	200
R10	11,000
R11	22,000
R12	1000
R13	KS-13490, L1, 100

TRANSISTOR

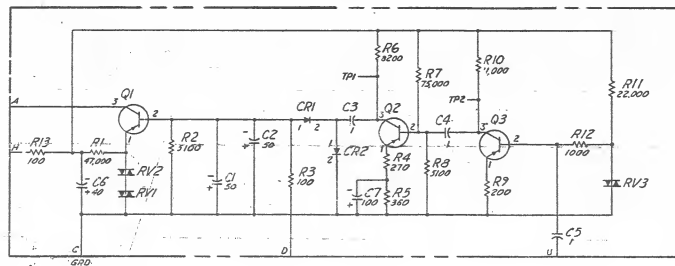
DESIG	CODE
Q1	12N
Q2	
Q3	

VARIATOR

DESIG	CODE
RV1	1000
RV2	1000
RV3	1000

CPS 1

DIAL TONE DETECTOR



CIRCUIT DESCRIPTION

THE DIAL TONE DETECTOR IS COMPOSED OF TWO STAGES OF AMPLIFICATION, A RECTIFIER, AND A DRIVER STAGE. WITH -45V APPLIED TO TERMINAL "A" AND NO INPUT TO TERMINAL "B" THE VOLTAGE AT TP2 IS APPROXIMATELY -26V DC, THE VOLTAGE AT TP1 IS APPROXIMATELY -15V DC, AND THE VOLTAGE AT TERMINAL "A" WHEN CONNECTED THROUGH A 2500 OHM RELAY (OR EQUIVALENT) TO -45V DC IS -45V DC, WITH A SINE WAVE OF 400 Hz AT 200 MV PEAK-TO-PEAK APPLIED TO TERMINAL "B", THE SIGNAL AT TP2 IS APPROXIMATELY 2V AC PEAK-TO-PEAK AND THE SIGNAL AT TP1 IS APPROXIMATELY 4V AC PEAK-TO-PEAK. CAPACITORS C1 AND C2 CHARGE THROUGH CR1 DURING THE NEGATIVE SWINGS OF COLLECTOR Q2 UNTIL THE CHARGE IS SUFFICIENT TO OVERCOME THE BIAS, DUE TO RV1 AND RV2, ON Q1. Q1 WHEN OPERATED WILL OPERATE THE RELAY CONNECTED TO TERMINAL "A". Q1 WILL REMAIN OPERATED UNTIL THE INPUT SIGNAL IS REMOVED FROM TERMINAL "U". Q1 OPERATES IN APPROXIMATELY 400 MS FROM APPLICATION ON THE INPUT SIGNAL AT "B".

MANUFACTURING REFERENCES

CATEGORY	NUMBER
CIRCUIT PACK CODE	ED-19434(-)
ASSEMBLY DRAWING	ED-19434(-)
MANUFACTURING TEST REQUIREMENTS	
CONNECTOR ON FRAME	KS-19331, L1

SYMBOL
NONE

NOTES:

- UNLESS OTHERWISE SPECIFIED:
RESISTANCE VALUES ARE IN OHMS.
CAPACITANCE VALUES ARE IN MICROFARADS.
VALUES PRECEDED BY THE SYMBOL + (PLUS)
OR - (MINUS) ARE IN VOLTS.

FAR END TEST TRUNK
OR LINE CIRCUITBELL TELEPHONE LABORATORIES
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SD-99308-01-J

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INPUT/OUTPUT

THIS INFORMATION IS INCLUDED IN THE CIRCUIT DESCRIPTION.

CIRCUIT DESCRIPTION

THIS CIRCUIT IN CONJUNCTION WITH A START CONTACT, AN EXTERNAL RESISTOR AND AN OUTPUT RELAY PROVIDES A VARIABLE TIME INTERVAL BETWEEN INPUT AND OUTPUT. THERE ARE THREE BASIC MODES OF OPERATION WHICH CAN BE CALLED MAKE CONTACT START, THE BREAK CONTACT START, AND THE EARLY BREAK MAKE START.

1. MAKE CONTACT START

THE CIRCUIT PACK EXTERNAL CONNECTIONS ARE AS FOLLOWS:

TERMINAL 1 CONNECTS THROUGH THE TIMING RESISTANCE (R) TO GROUND; TERMINAL 2 CONNECTS TO THE MAKE PORTION OF THE START CONTACT WITH ITS FIXED PORTION CONNECTED TO -85V; TERMINAL 3 ALSO CONNECTS TO THE TERMINAL OF THE OUTPUT RELAY WITH ITS OTHER TERMINAL CONNECTED TO TERMINAL 4; TERMINALS 5 AND 6 CONNECT TO -85V BATTERY; TERMINAL 4 IS VACANT; TERMINAL 5 IS GROUND.

WITH THE START CONTACT NORMAL, TRANSISTORS (Q1), (Q2) AND (Q3) ARE FORWARD BIASED AND IN THEIR "ON" STATE. EVEN THOUGH (Q3) IS ON, THE OUTPUT RELAY CANNOT OPERATE BECAUSE ITS OPERATE PATH CONTAINS THE NORMAL START CONTACT.

WHEN THE START CONTACT CLOSURES, THE TERMINAL 2 SIDE OF CAPACITOR (C1) WHICH HAS GROUND POTENTIAL CHANGES TO -85V CAUSING THE POTENTIAL AT THE TERMINAL 1 SIDE OF (C1) TO CHANGE FROM APPROXIMATELY -85V TO -85V. THIS REVERSE BIASES (Q1) WHICH CAUSES (Q2) AND (Q3) TO TURN OFF. THE OPERATE PATH OF THE OUTPUT RELAY IS NOW ESTABLISHED BUT SINCE (Q3) IS OFF THE RELAY DOES NOT OPERATE.

CAPACITOR (C1) STARTS DISCHARGING TOWARDS GROUND THROUGH THE EXTERNAL CHARGING RESISTOR. WHEN TERMINAL 1 REACHES APPROXIMATELY -85V, TRANSISTORS (Q1) AND (Q2) AND DIODE (CR2) ARE FORWARD BIASED SUFFICIENTLY TO CONDUCT. THIS CAUSES (Q3) TO TURN ON, OPERATING THE OUTPUT RELAY.

WHEN THE START CONTACT IS OPENED THE TERMINAL 2 SIDE OF (C1) STARTS TO CHARGE FROM -85V TO GROUND AND THE OUTPUT RELAY RELEASES BECAUSE ITS OPERATE PATH IS OPENED BY THE OPEN START CONTACT. THE CHARGING PATH IS THROUGH (R1), (Q3), AND THE FORWARD BIASED JUNCTIONS OF (Q1), (Q2) AND (Q2). THE CIRCUIT IS NOW COMPLETELY RECYCLED AND READY FOR ANOTHER START SIGNAL. THE TIME INTERVAL BETWEEN THE START SIGNAL AND THE TIME WHEN THE OUTPUT RELAY STARTS TO OPERATE IS $t = 0.7 R_1 C_1 \ln 5$ WHEN 1% COMPONENTS ARE USED AS R AND C. THE MAXIMUM VALUE OF (R) IS 4.33 MEG. CAPACITANCE CAN BE ADDED FOR ADDITIONAL TIME BY CONNECTING CAPACITORS BETWEEN TERMINALS 1 AND 2.

2. BREAK CONTACT START

THE CIRCUIT PACK EXTERNAL CONNECTIONS ARE AS FOLLOWS: TERMINAL 1 CONNECTS TO THE BREAK PORTION OF THE START CONTACT WITH ITS FIXED PORTION CONNECTED TO -85V; TERMINAL 2 CONNECTS THROUGH THE TIMING RESISTANCE (R) TO GROUND; TERMINAL 3 CONNECTS TO TERMINAL 3; TERMINAL 4 CONNECTS TO A -24V VOLTAGE DIVIDER; TERMINAL 5 IS VACANT; TERMINAL 6 IS GROUND; TERMINAL 5 CONNECTS TO THE TERMINAL OF THE OUTPUT RELAY WITH THE OTHER TERMINAL CONNECTED TO -85V. TERMINAL 7 CONNECTS TO -85V BATTERY.

WITH THE START CONTACT NORMAL, (Q1) IS REVERSE BIASED KEEPING (Q2) AND (Q3) OFF. THE OUTPUT RELAY IS THEREFORE, NORMAL.

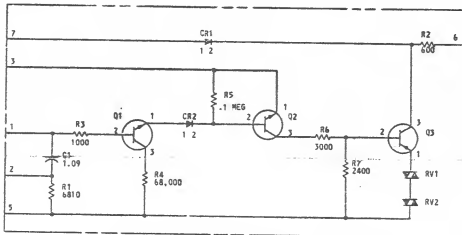
WHEN THE START CONTACT IS OPENED, THE TERMINAL 1 SIDE OF (C1) WHICH WAS AT -85V STARTS TO DISCHARGE TOWARDS GROUND THROUGH THE EXTERNAL CHARGING RESISTOR (R) AND THE EQUIVALENT SOURCE RESISTANCE OF THE -24V VOLTAGE DIVIDER. (Q1), (Q2), (Q2) AND (Q3) START TO CONDUCT WHEN THE TERMINAL 1 SIDE OF (C1) REACHES APPROXIMATELY -24V. AS CURRENT FLOWS INTO THE EQUIVALENT SOURCE RESISTANCE OF THE DIVIDER AT TERMINAL 1, THAT POINT BECOMES POSITIVE INSTEAD OF -24V. THIS CHANGE IS REFLECTED THROUGH (C1), TURNING (Q1) ON QUICKLY BY MEANS OF POSITIVE FEEDBACK. THE OUTPUT RELAY OPERATES WHEN (Q3) SATURATES.

WHEN THE START CONTACT CLOSURES, (C1) DISCHARGES THROUGH THE EQUIVALENT RESISTANCE OF THE VOLTAGE DIVIDER, BACK BIASES (Q1) WHICH TURNS OFF (Q2), (Q3) AND RELEASES THE OUTPUT RELAY. AFTER THE TERMINAL 1 SIDE OF (C1) RETURNS TO -24V, THE CIRCUIT IS COMPLETELY RECYCLED AND READY FOR ANOTHER START SIGNAL.

THE TIME INTERVAL BETWEEN THE START SIGNAL AND THE TIME WHEN THE OUTPUT RELAY STARTS TO OPERATE IS $t = 0.7 R_1 C_1 \ln 5$ WHEN 1% COMPONENTS ARE USED AS R AND C. THE MAXIMUM SIZE R USED IS DEPENDENT ON THE RESISTANCE VALUE OF THE VOLTAGE DIVIDER, BUT IN GENERAL IS ABOUT 1.93 MEG IF THE VOLTAGE DIVIDER USES RESISTORS OF LESS THAN 400 OHMS RESISTANCE. CAPACITANCE CAN BE ADDED TO INCREASE THE TIME INTERVAL AS IN THE MAKE CONTACT START.

CPS D3

TIMER



CIRCUIT DESCRIPTION (CONT.)

3. EARLY BREAK MAKE START

THE CIRCUIT PACK EXTERNAL CONNECTIONS ARE AS FOLLOWS: TERMINAL 1 CONNECTS THROUGH THE TIMING RESISTANCE (R) TO GROUND; TERMINAL 2 ALSO CONNECTS TO THE BREAK PORTION OF THE START CONTACT WITH ITS FIXED PORTION CONNECTED TO -85V; TERMINAL 3 CONNECTS TO THE MAKE PORTION OF THE START CONTACT; TERMINAL 4 ALSO CONNECTS TO THE TERMINAL OF THE OUTPUT RELAY WITH ITS OTHER TERMINAL CONNECTED TO TERMINAL 5; TERMINALS 6 AND 7 CONNECT TO -85V BATTERY; TERMINAL 4 IS VACANT; TERMINAL 5 IS GROUND.

WITH THE START CONTACT NORMAL, TRANSISTOR (Q1) IS REVERSE BIASED AND TRANSISTORS (Q2) AND (Q3) ARE IN THE OFF STATE.

WHEN THE START CONTACT CLOSURES, THE TERMINAL 2 SIDE OF CAPACITOR (C1), WHICH WAS AT GROUND POTENTIAL, CHANGES TO -85V CAUSING THE POTENTIAL AT THE TERMINAL 1 SIDE OF (C1) TO CHANGE FROM -85V TO -85V. CAPACITOR (C1) STARTS DISCHARGING TOWARDS GROUND THROUGH THE EXTERNAL CHARGING RESISTOR. WHEN TERMINAL 1 REACHES APPROXIMATELY -85V, TRANSISTORS (Q1) AND (Q2) AND DIODE (CR2) ARE FORWARD BIASED SUFFICIENTLY TO CONDUCT. THIS CAUSES TRANSISTOR (Q3) TO TURN ON, OPERATING THE OUTPUT RELAY.

WHEN THE START CONTACT IS OPENED THE TERMINAL 2 SIDE OF (C1) STARTS TO CHARGE FROM -85V TO GROUND AND THE OUTPUT RELAY RELEASES BECAUSE ITS OPERATE PATH IS OPENED BY THE OPEN START CONTACT. THE CHARGING PATH IS THROUGH THE CLOSED BACK PORTION OF THE START CONTACT TO -85V.

THE CIRCUIT IS NOW COMPLETELY RECYCLED AND READY FOR ANOTHER START SIGNAL. THE TIME INTERVAL BETWEEN THE START SIGNAL AND THE TIME WHEN THE OUTPUT RELAY STARTS TO OPERATE IS $t = 0.7 R_1 C_1 \ln 5$ WHEN 1% COMPONENTS ARE USED AS R AND C. THE MAXIMUM VALUE OF (R) IS 4.33 MEG. CAPACITANCE CAN BE ADDED FOR ADDITIONAL TIME BY CONNECTING CAPACITORS BETWEEN TERMINALS 1 AND 2.

NOTES:

- UNLESS OTHERWISE SPECIFIED:
RESISTANCE VALUES ARE IN OHMS.
CAPACITANCE VALUES ARE IN MICROFARADS,
VALUES PRECEDED BY THE SYMBOL μ (PLUS)
OR - (MINUS) ARE IN VOLTS.

MANUFACTURING REFERENCES

CATEGORY	NO.
CONTROLLING DRAWING	SD-32371-01
CIRCUIT PACK CODE	D3
CONNECTOR OR FRAME	910A

SYMBOL

